

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
24 June 2004 (24.06.2004)

PCT

(10) International Publication Number  
**WO 2004/052342 A1**

(51) International Patent Classification<sup>7</sup>: **A61K 9/20**,  
47/38, 31/5377, A61P 25/00

(21) International Application Number:  
PCT/SE2003/001910

(22) International Filing Date: 8 December 2003 (08.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0203778-6 9 December 2002 (09.12.2002) SE

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(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Published:**

— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A NEW ORAL IMMEDIATE RELEASE DOSAGE FORM

(57) Abstract: The present invention relates to a solid oral immediate release dosage form of a pharmaceutically active compound, *N*-[(1,2,3,4-tetrahydro-5-methyl-8-(4-methylpiperazin-1-yl)-2-naphthyl]-4-morpholinobenzamide, in the form of the free base or pharmaceutically acceptable salts thereof. The invention further relates to processes for preparing said dosage form, the use of said dosage form and a method of prevention and/or treatment of CNS disorders and related medical disturbances using said dosage form.

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## A NEW ORAL IMMEDIATE RELEASE DOSAGE FORM

### FIELD OF THE INVENTION

The present invention relates to an oral immediate release dosage form of a  
5 pharmaceutically active compound, *N*-[(1,2,3,4-tetrahydro-5-methyl-8-(4-methylpiperazin-1-yl)-2-naphthyl]-4-morpholinobenzamide, in the form of the free base or pharmaceutically acceptable salts thereof. The invention further relates to processes for preparing said dosage form and the use of said dosage form in therapy such as prevention and/or treatment of disorders in the CNS and related disturbances.

### BACKGROUND OF THE INVENTION

The development of a new pharmaceutically active compound is often hampered or even  
blocked due to unwanted physico-chemical properties of the new active compound. Some of  
the properties may be overcome by developing suitable pharmaceutical formulations. This is  
for example true for active ingredients that agglomerates upon contact with water and/or  
15 intestinal fluids and does not dissolve in a period of time that would be usable for a  
pharmaceutical formulation. An active compound that agglomerates upon contact with water  
cannot become rapidly available after administration. Such a delay in release of the active  
compound results in a delay of onset of action of the active compound.

*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-  
20 morpholinobenzamide is an active compound that agglomerates upon contact with water. *N*-  
[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide  
may be used in the prevention and/or treatment of disorders and related disturbances in the  
central nervous system (CNS).

Formulating *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-  
25 morpholinobenzamide in a pharmaceutical composition has been difficult due to the fact that  
agglomerates are formed upon contact with water. The use of excipients such as binders, e.g.  
hydroxypropyl cellulose, microcrystalline cellulose and gelatine and the like and insoluble  
fillers such as microcrystalline cellulose, dibasic calcium phosphate do not prevent the active  
compound from forming agglomerates. The agglomerate forming properties of the active  
30 compound make it difficult to prepare an immediate release dosage form of this active  
compound.

It has now surprisingly been found that disintegrants, especially the so called super-disintegrants, are useful in the preparation of dosage forms with agglomerate forming active compound such as *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide. It is believed that disintegrants physically prevents the primary  
5 particles of the active compound to form agglomerates in the presence of water. By using disintegrants the dosage form disintegrates in small granules upon contact with water, thereby making the active compound readily available after administration without any agglomerates being formed of the active compound.

Disintegrants are known for their wicking capacity to channel water into the interior of a  
10 pharmaceutical composition and rapidly swell in water, thereby preventing the primary particles of the active compound to form agglomerates.

Disintegrants have been used in pharmaceutical compositions like flash-melt compositions to increase the disintegration of pharmaceutical compositions.

EP 1145711 describes a flash-melt composition comprising an active compound, a  
15 disintegrant, a dispersing agent, a distribution agent and a binder. This pharmaceutical composition dissolves within 25 seconds in the mouth.

WO 01/76565 discloses a fast disintegration composition comprising a disintegrant, a filler, a sugar alcohol and a lubricant. This composition dissolves within 90 seconds in the mouth.

WO 01/12161 discloses a process for the manufacturing of a rapid dissolving dosage form  
20 that dissolves within 30 seconds in the mouth.

The multifunctional use of disintegrants has also been described.  
In WO 02/03987 disintegrants have been used to increase the stability and dissolution of poorly soluble drugs.

In WO 00/02536 describes the use of disintegrants as a disintegrant and as a taste masker.  
25 The active compound is coated with the disintegrant to cover the bitter taste of the active compound.

JP 10114655 discloses a solid preparation of an active compound that forms a gel in an acidic solution. Disintegrants are used to prevent the active compound of forming a film on the surface of the acidic solution.

30 The problems in obtaining a solid oral immediate release dosage form comprising an active compound such as *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-

naphthyl]-4-morpholinobenzamide, an active ingredient that agglomerates upon contact with water and/or intestinal fluids, has not been addressed well in the prior art.

There is still a need for a suitable solid oral immediate release dosage form of active compound, that forms agglomerates upon contact with water, at acid, neutral and basic pH, whereby the dosage form provides a rapid release of the active compound within a period of time that would be usable for a pharmaceutical formulation after administration in mammals.

The problem for active ingredients that agglomerates upon contact with water and/or intestinal fluids and does not dissolve in a period of time that would be usable for a pharmaceutical formulation can also be overcome by using a filler with a sufficiently high solubility in water and/or intestinal fluids.

We have now surprisingly found that disintegrants or soluble fillers may be used to prepare a solid dosage form comprising agglomerate forming active compound such as *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide. In the present invention disintegrants and/or soluble fillers physically prevents the primary particles of the active compound to form agglomerates in the presence of water and thus making it possible to have the active compound, *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide, readily available after administration of the dosage form.

#### DETAILED DESCRIPTION OF THE INVENTION

The present invention provides for a solid oral immediate release dosage form that is especially suitable for, in an aqueous environment, active ingredients that agglomerates upon contact with water and/or intestinal fluids and does not dissolve in a period of time that would be usable for a pharmaceutical formulation. The oral immediate release dosage form comprises an active compound, at least one disintegrant and/or at least one soluble filler, with or without one binder, and optionally other excipients, whereby the amount of the active compound may be up to 90% (w/w).

The oral dosage form of the present invention provides for a rapid release profile of the active compound *in vivo* having a rapid initial rise in blood plasma concentration thereby providing a fast onset of effect of the active compound. Compared to an immediate release dosage form that does not comprise a disintegrant and/or soluble filler, the present invention provides for a dosage form having less fluctuations of the intra patient-patient blood plasma

concentration and thus less risk for plasma concentrations being outside the therapeutic window.

Active compounds that are specifically suitable to use in the present invention are pharmaceutically active compounds with an agglomerate-forming tendency, in an aqueous environment, at any pH.

In one aspect of the invention the oral immediate release dosage form comprises as active compound, *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide in the form of the free base or pharmaceutically acceptable salts thereof.

A further aspect of the present invention relates to the oral immediate release dosage form comprising as active compound, (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide.

Particularly suitable is the monohydrobromide salt of (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide.

(*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide is slightly soluble in water (6.4 mg/ml), sparingly soluble in ethanol/water 1:1 (19 mg/ml) and sparingly soluble in 0.1 M HCl (11 mg/ml). (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide has a plasma elimination half-life,  $t_{1/2}$ , of 35 hours in man. (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide has shown to have at least five crystal modifications, named A, B, C, D and E. Any of these crystal forms A, B, C, D and E may be used in the preparation of the dosage form of the present invention. Form A is an anhydrate form and is the preferred crystal form.

The present invention relates to an oral immediate release dosage form comprising *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide as the active compound, in the form of the free base or pharmaceutically acceptable salts, thereof, at least one disintegrant and/or at least one soluble filler, with or without one binder and optionally other excipients.

More specifically, the present invention relates to an oral immediated release dosage form comprising

*N*-[5-methyl-8-(4-methylpiperazin-1-yl)- 3 to 90 % (w/w)

1,2,3,4-tetrahydro-2-naphthyl]-4-

morpholinobenzamide

Disintegrants 0 to 20% (w/w)

5 Soluble fillers 0 to 80% (w/w)

Binders 1 to 10 % (w/w)

Other excipients up to 100% (w/w)

10 When the dosage form of the invention contains one disintegrant it may be selected from the group of carboxymethylene celluloses. For example, the disintegrant is the salt of crosslinked carboxymethylene cellulose such as a salt of an alkaline earth metal, e.g. the sodium salt.

15 The invention relates to the oral immediate release dosage form, whereby the disintegrants are selected from the group consisting of croscarmellose sodium, sodium starch glycollate, crospovidone, microcrystalline cellulose, low substituted hydropropyl cellulose, soy polysaccharide, starch, alginic acid, sodium alginate, polacrillin potassium, magnesium aluminium silicate and amberlite resins.

The invention further relates to the oral immediated release dosage form wherein the disintegrant is croscarmellose sodium.

20 Excipients enhancing the dissolution in a neutral or acid aqueous environment, such as sodium- or potassium carbonate or -bicarbonate alone or in combination with citric acid, ascorbic acid or tartaric acid, may also be used in the oral immediate release dosage form.

The amount of disintegrants in the immediate release dosage form of the present invention may be in the range from 0 to 40% (w/w), preferably 5 to 20% (w/w).

25 The weight ratio of active compound to disintegrants in the oral immediate release dosage form of the present invention, may be from 6:1 to 1:2, preferably from 3:1 to 1:1.

30 When the dosage form of the invention contains at least one soluble filler it may be selected from the group of sugars, sugar alcohols and salts with sufficiently high solubility in water at ambient conditions. Examples of water-soluble fillers are: lactose, sucrose, dextrose, mannitol, sorbitol, xylitol, maltose, maltodextrin, maltitol, lactitol, fructose, dextrans and a number of inorganic salts.

In one aspect of the invention the oral immediated release dosage form comprises binders selected from the group comprising of hydroxypropyl cellulose, microcrystalline cellulose, polyvinylpyrrolidone, gelatine, polyethylene glycol, glycerylbehenate, glycerylmonostearate, ethylcellulose, ceratonia, hydroxy propylmethylcellulose, hydroxy ethylcellulose, polydextrose, polyethyleneoxide, zein, carboxy polymethylene and carnauba wax or a mixture thereof.

A suitable binder is polyvinylpyrrolidone with an average molecular weight between 25.000 and 35.000.

The amount of binders in the immediate release dosage form of the present invention may be in the range from 0 to 20 % (w/w), preferably 1 to 10% (w/w).

The weight ratio of active compound to binders may be from 8:1 to 1:2, preferably from 7:1 to 1:3.

Beside the disintegrants, soluble fillers and binders, the oral immediate release dosage form may optionally comprise other excipients, such as lubricants, fillers, flow condition agents and the like.

In one aspect of the invention the oral immediate release dosage form comprises lubricants selected from the group of magnesium stearate, calcium stearate, zink stearate, carbomer, sodium stearyl fumarate, glyceryl monostearate, poloxamer, sodium benzoate, sodium lauryl sulphate, stearic acid, polyethylene glycol and talc.

In one aspect of the invention the oral immediate release dosage form comprises fillers selected from the group of calcium phosphates, starches, microcrystalline cellulose, calcium sulphate, polyethylene glycol, calcium carbonate, magnesium carbonate, magnesium oxide and kaolin.

In one aspect of the invention the oral immediate release dosage form comprises flow condition agents such as e.g. colloid silicon dioxide.

The amounts of these other excipients in the immediate release dosage form of the present invention may be in the range of 15 to 97 % (w/w).

The dosage form may be prepared by mixing the active compound, the disintegrants, soluble fillers, binders and optionally other excipients such as lubricants, fillers and flow condition agents and the like in a suitable mixer, e.g. a Turbula mixer. The dry mix may then be filled directly into an oral dosage form.

Another route is to compress said homogeneous mixture comprising the active compound, the disintegrants, soluble fillers and the binders. These compacts may be milled through a screen and finally mixed with additional excipients such as lubricants, fillers, flow condition agents and the like and filled into an oral dosage form.

5 Alternatively, the dosage form may be prepared from a granulated powder. A homogeneous powder mixture may be obtained by mixing the active compound, the disintegrants, soluble fillers and optionally excipients such as binders in a suitable mixer. The mixture may then be granulated in water or another granulation liquid such as an alcohol, e.g. ethanol, methanol, isopropanol, a ketone, e.g. acetone or aqueous mixtures thereof. From an  
10 environmental point of view water is preferred. The resulting wet granules may thereafter be dried in a drying cabinet, vacuum dryer or in a fluid bed dryer and milled through a screen. The granulation may also be performed at elevated temperatures by using meltable binders. The manufactured granules may be milled through a screen. The granules are then mixed with other excipients and filled into a suitable oral dosage form.

15 The above processes are intended to make capsules. Other suitable oral dosage forms to be prepared by the above mentioned granules are tablets, compacted tablets, minitables and the like.

The present invention relates to an oral immediate release dosage form, wherein the dosage form is in the form of a tablet or a capsule.

20 The present invention also relates to processes for the manufacture of the immediate release dosage form characterized by,

Method A, comprising the steps:

Ai) mixing the active compound with the disintegrant, soluble fillers, binders and optionally lubricants, fillers and other excipients,

25 Aii) forming the obtained dry powder mixture into a suitable solid dosage form,

Or,

Method B, comprising the steps:

Bi) mixing the active compound with the disintegrant, soluble fillers, binders and other excipients,

30 Bii) granulating said mixture,



Biii) optionally drying or cooling the obtained granules,

Biv) mixing the granules with other excipients,

Bv) filling the obtained dry powder mixture into a suitable solid dosage form.

Further, the present invention relates to an oral immediate release dosage form which has  
5 an *in vitro* dissolution profile in 50 mM acetate buffer, pH 5.5 with apparatus 2 described in  
USP 24, paddle method at 75 rpm, such that 85 % or more of the active compound is released  
within 30 minutes.

The composition from which the dosage form is prepared can be formulated to contain  
the active compound in different amounts, e.g. between 1 and 150 mg, preferably between 5  
10 and 120 mg, but is not limited to these intervals. These figures are presented as the free base.  
Suitable daily doses of the active compound may vary within a wide range and will depend on  
various factors such as the relevant disorder or medical conditions, the age, weight and sex,  
and may be determined by a physician.

The oral immediated release dosage form of the invention may thus comprise

15	<i>N</i> -[5-methyl-8-(4-methylpiperazin-1-yl)- 1,2,3,4-tetrahydro-2-naphthyl]-4- morpholinobenzamide	3 to 90 % (w/w)
	Disintegrants	0 to 20% (w/w)
	Soluble fillers	0 to 80% (w/w)
20	Binders	1 to 10 % (w/w)
	Lubricants	0 to 2 % (w/w)
	Flow condition agents	0 to 2 % (w/w)
	Fillers	up to 100% (w/w)

### Medical and Pharmaceutical Use

25 One aspect the present invention provides the use of the oral immediate release dosage  
form in therapy. *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-  
1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide may be used as 5-HT 1B antagonists,  
partial agonists or full agonists, preferably as antagonists. Therefore, the oral immediate  
release dosage form comprising this active compound may be use in the prevention and/or  
30 treatment of disorders in the CNS and related disturbances such as 5-hydroxytryptamine  
mediated disorders. Examples of such disorders are disorders in the central nervous system  
(CNS) and related disturbances such as mood disorders (depression, major depressive

disorder, major depressive episodes, dysthymia, seasonal affective disorder, depressive phases of bipolar disorder), anxiety disorders (obsessive compulsive disorder, panic disorder with/without agoraphobia, social phobia, specific phobia, generalized anxiety disorder, posttraumatic stress disorder), personality disorders (disorders of impulse control, trichotellomania), obesity, anorexia, bulimia, premenstrual syndrome, sexual disturbances, alcoholism, tobacco abuse, autism, attention deficit, hyperactivity disorder, migraine, memory disorders (age associated memory impairment, presenile and senile dementia), pathological aggression, schizophrenia, endocrine disorders (e g hyperprolactinaemia), stroke, dyskinesia, Parkinson's disease, thermoregulation, pain, hypertension. Other examples of hydroxytryptamine-mediated disorders are urinary incontinence, vasospasm and growth control of tumors (e g lung carcinoma).

Another aspect of the invention relates to the use of the oral immediate release dosage form of the present invention in prevention and/or treatment of mood disorders, anxiety disorders, personality disorders, obesity, anorexia, bulimia, premenstrual syndrome, sexual disturbances, alcoholism, tobacco abuse, autism, attention deficit, hyperactivity disorder, migraine, memory disorders, pathological aggression, schizophrenia, endocrine disorders, stroke, dyskinesia, Parkinson's disease, thermoregulatory disorders, pain, hypertension, major depressive disorder, urinary incontinence, vasospasm and growth control of tumors.

A further aspect of the present invention relates to the use of the oral immediate release dosage form of the present invention in the manufacturing of a medicament for prevention and/or treatment of disorders in the CNS and related disturbances such as 5-hydroxytryptamine mediated disorders and any other disorders listed above.

A further aspect of the invention relates to a method for prevention and/or treatment of disorders in the CNS and related disturbances such as 5-hydroxytryptamine mediated disorders and any other disorders listed above, comprising administering to a mammal in need of such prevention and/or treatment oral immediate release dosage form of the present invention, effective for said prevention and/or treatment.

The term "rapid" as used in this specification means within 60 minutes, preferably within 30 minutes.

### Abbreviations

CNS	Central Nervous System
t	time (h)

$t_{1/2}$	plasma elimination half-life (h)
$C_{max}$	Maximum plasma drug concentration (nmol/L)
$t_{max}$	Time to reach maximum plasma drug concentration following drug administration (h)
PEG	Polyethylene glycol
PVP	Polyvinylpyrrolidone

### Examples

The invention will now be illustrated by the following non-limiting example.

#### **Example 1:**

- 10 The following components, expressed as mg per capsule, were used in order to manufacture 50 mg capsules; batch size 28000 capsules:

Active compound:	59
PVP K-25	8.9
15 Croscarmellose sodium	17.9
Mannitol	93
Water	71.5
Magnesium stearate	0.45
Colloidal silicon dioxide	0.45

20

The active compound, (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide, were screened through a 0.5 mm square screen. PVP K-25 and croscarmellose sodium were added and all the ingredients were thereafter mixed in a Turbula mixer for 10 minutes at 30 rpm.

- 25 The powder mixture was then transferred to a high shear mixer. Mannitol, sieved though a 0.5 mm square screen, was added and the powder mass was further mixed for 10 minutes at 150 rpm. This powder mixture was then granulated with water in the high shear mixer for 2 minutes and 45 seconds at 150 rpm. A chopper was used during the last 15 s at 2000 rpm. The formed wet granules were dried in a drying cabinet at +50°C for 5 hours. The
- 30 granules were milled in an oscillating granulator through a screen of 1.00 mm. The dry granules were then mixed with colloidal silicon dioxide (screened through 0.5 mm) in a

Turbula mixer for 3 minutes at 30 rpm. Magnesium stearate was added through a screen of 0.5 mm and the mixing was continued for further 45 seconds.

The final homogeneous dry powder mixture was filled into hard gelatine capsules size no. 1, colour Swedish orange, in a capsule-filling machine.

5 In order to test the release rate of the active drug compound from the capsules an *in vitro* dissolution of the capsule was accomplished by using the USP paddle method, 75 rpm. (Dissolution Test, USP 24)

Used conditions:

Medium: acetate buffer, pH = 5.5, volume: 1000 ml, temperature: +37°C.

10 The following results were obtained:

Time	
(min)	Amount
	dissolved %
0	0
5	5
10	26
15	48
20	68
25	86
30	98
45	101
60	102

25 Conclusion:

From the Example it is evident that with the oral dosage form according to the present invention an immediate release is achieved by using the disintegrant.

**Bioavailability**

30 A single dose bioavailability study was performed in healthy volunteers. Two different formulations of (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide were tested. One group of fasting 6 volunteers received (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-

morpholinobenzamide monohydrobromide as an aqueous solution (n=6). The other group of 5 volunteers received (R)-N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide in an immediate release capsule (n=5). The composition of the capsule is according to example 1, except that the concentration of the active compound was lower (3.3%). The dose in both dosing groups was 15 mg (calculated as the base). Plasma samples were withdrawn prior to and up to 200 hours after drug administration (for solution dosing group up to 48 hours). Determination of (R)-N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide in the plasma was performed using liquid chromatography-tandem mass spectrometry (LC-MS-MS). After oral administration of (R)-N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide, the following pharmacokinetic parameters of the corresponding base were estimated: maximum plasma drug concentration ( $C_{max}$ ), time to reach  $C_{max}$  following drug administration ( $t_{max}$ ), area under plasma concentration-time curve from zero to infinity ( $AUC_{(0-\infty)}$ ), terminal half-life ( $t_{1/2}$ ) and oral clearance ( $CL/F$ ). The results are presented in Table A below.

Table A. Pharmacokinetic data obtained after administration of an oral solution compared to the oral immediate release dosage form of Example 1. Dose 15 mg (as the base)

Dosing form		$t_{max}$ (hours)	$C_{max}$ (nmol/L)	$t_{1/2}$ (hours)	$AUC_{(0-\infty)}$ (nmol*h/L)	$CL/F$ (L/h)
Oral solution (n=6)	Mean	5.0	31.7	35.2	1314	26.5
	SD	2.2	13.4	8.0	290	6.1
	Median	5.5	26.0	33.7	1295	25.9
	Range	2.0 - 8.0	20.3 - 49.1	25.7 - 47.6	918 - 1744	19.2 - 36.4

Dosing form		$t_{\max}$ (hours)	$C_{\max}$ (nmol/L)	$t_{1/2}$ (hours)	$AUC_{(0-\infty)}$ (nmol*h/L)	CL/F (L/h)
Capsules	Mean	4.6	32.9	37.1	1295	26.2
3 x 5 mg	SD	1.7	8.2	6.2	176	3.6
(n=5)	Median	5.0	35.7	35.4	1254	26.7
	Range	3.0 - 7.0	23.0 - 41.0	30.2 - 44.1	1084 - 1479	22.6 - 30.8

The results show that the oral immediate release dosage form according to the present invention provides a blood plasma profile of the active compound similar to when the active compound is administered orally in an aqueous solution. This is valid for both the  $t_{\max}$  and the  $C_{\max}$ . The initial rise in blood plasma concentration is achieved by administration of the active compound in the oral immediate release dosage form of the present invention.

## CLAIMS

1. An oral immediate release dosage form comprising *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide as the active compound, in the form of the free base or pharmaceutically acceptable salts, thereof, at least one disintegrant and/or at least one soluble filler, with or without one binder, and optionally other excipients.
2. An oral immediated release dosage form comprising
- |   |                  |
|---|------------------|
| <i>N</i> -[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide | 3 to 90 % (w/w)  |
| Disintegrants   | 0 to 20% (w/w)   |
| Soluble fillers   | 0 to 80% (w/w)   |
| Binders   | 1 to 10 % (w/w)  |
| Other excipients  | up to 100% (w/w) |
3. The oral immediated release dosage form according to claims 1 or 2, wherein the active compound is (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide.
4. The oral immediated release dosage form according to any one of claims 1 to 3, wherein the salt of (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide is (*R*)-*N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide.
5. The oral immediate release dosage form according to any one of claims 1 to 4, wherein the disintegrants are selected from the group consisting of croscarmellose sodium, sodium starch glycollate, crospovidone, microcrystalline cellulose, low substituted hydropropyl cellulose, soy polysaccharide, starch, alginic acid, sodium alginate, polacrillin potassium, magnesium aluminium silicate and amberlite resins.

The invention further relates to the oral immediate release dosage form wherein the disintegrant is croscarmellose sodium.

Excipients enhancing the dissolution in a neutral or acid aqueous environment, such as sodium- or potassium carbonate or -bicarbonate alone or in combination with citric acid,  
5 ascorbic acid or tartaric acid, may also be used in the oral immediate release dosage form.

6. The oral immediate release dosage form according to claim 5, wherein the disintegrant is croscarmellose sodium.

10 7. The oral immediate release dosage form according to any one of claims 1 to 4, wherein the soluble fillers are selected from the group consisting of lactose, sucrose, dextrose, mannitol, sorbitol, xylitol, maltose, maltodextrin, maltitol, lactitol, fructose, dextrates and a number of inorganic salts.

15 8. The oral immediate release dosage form according to any one of claims 1 to 4, wherein the soluble fillers is mannitol.

9. The oral immediate release dosage form according to any one of claims 1 to 8, wherein the binders are selected from the group comprising of hydroxypropyl cellulose,  
20 microcrystalline cellulose, polyvinylpyrrolidone, gelatine, polyethylene glycol, glycerylbehenate, glycerylmonostearate, ethylcellulose, ceratonia, hydroxy propylmethylcellulose, hydroxy ethylcellulose, polydextrose, polyethyleneoxide, zein, carboxy polymethylene and carnauba wax or a mixture thereof.

25 10. The oral immediate release dosage form according to claim 11 wherein the binder is polyvinylpyrrolidone.

11. The oral immediate release dosage form according to any one of claims 1 to 10, wherein the other excipients are lubricants, fillers and flow condition agents.

30 12. The oral immediate release dosage form according to claim 11, wherein the lubricants are selected from the group of magnesium stearate, calcium stearate, zink stearate, carbomer,



sodium stearyl fumarate, glyceryl monostearate, poloxamer, sodium benzoate, sodium lauryl sulphate, stearic acid, polyethylene glycol and talc.

13. The oral immediated release dosage form according to claim 11, wherein the fillers are  
5 selected from the group of calcium phosphates, starches, microcrystalline cellulose, calcium sulphate, polyethylene glycol, calcium carbonate, magnesium carbonate, magnesium oxide and kaolin.

14. The oral immediate release dosage form according to claim 11, wherein the flow  
10 condition agent is colloid silicon dioxide.

15. The oral immediate release dosage form according to any one of claims 1 to 14,  
wherein the ratio of active compound to disintegrants is from 6:1 to 1:2, preferably from 3:1  
to 1:1.

16. The oral immediate release dosage form according to any one of claims 1 to 15, where  
15 in the weight ratio of active compound to binders may be from 8:1 to 1:2.

17. The oral immediate release dosage form according to any one of claims 1 to 16,  
20 wherein the dosage form is in the form of a capsule or a tablet.

18. The oral immediate release dosage form according to any one of claims 1 to 17,  
whereby the dosage form has a mean dissolution profile *in vitro*, in 50 mM acetate buffer, pH  
of 5.5, using USP Paddle method at 75 rpm, such that at least 85 % of the active compound is  
25 released within 30 minutes.

19. Processes for the manufacture of an oral immediate release dosage form according to  
any one of claims 1 to 17 characterized by,

Method A, comprising the steps:

30 Ai) mixing the active compound with the disintegrant, soluble fillers, binders and optionally lubricants, fillers and other excipients,

Aii) forming the obtained dry powder mixture into a suitable solid dosage form,

Or,

Method B, comprising the steps:

Bi) mixing the active compound with the disintegrant, soluble filler and optionally binders and other excipients,

5 Bii) granulating said mixture,

Biii) optionally drying or cooling the obtained granules,

Biv) mixing the granules with other excipients,

Bv) filling the obtained dry powder mixture into suitable solid dosage form.

10 20. Use of an oral immediate release dosage form according to any one of claims 1 to 17 for use in therapy.

21. The use according to claim 20 for the prevention and/or treatment of disorders in the central nervous system and related disturbances.

15 22. The use according to claim 20 for the prevention and/or treatment of mood disorders, anxiety disorders, personality disorders, obesity, anorexia, bulimia, premenstrual syndrome, sexual disturbances, alcoholism, tobacco abuse, autism, attention deficit, hyperactivity disorder, migraine, memory disorders, pathological aggression, schizophrenia, endocrine  
20 disorders, stroke, dyskinesia, Parkinson's disease, thermoregulatory disorders, pain and hypertension.

23. The use according to claim 20 for the prevention and/or treatment of major depressive disorder.

25 24. The use according to claim 20 for the prevention and/or treatment of urinary incontinence, vasospasm and growth control of tumors.

30 25. The use according to claim 20 for the prevention and/or treatment of 5-hydroxytryptamine mediated disorders.

26. Use of an oral immediate release dosage form according to any one of claims 1 to 17, in the manufacturing of a medicament for prevention and/or treatment of disorders in the CNS and related disturbances.
- 5 27. A method for prevention and/or treatment of disorders in the central nervous system and related disturbances, comprising administering to a mammal in need of such prevention and/or treatment oral immediate release dosage form according to any one of the claims 1 to 17, effective for said prevention and/or treatment.
- 10 28. An oral immediate release dosage form according to any one of claims 1 to 17, whereby the dosage form upon administration provides  $t_{\max}$  for (R)-N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphthyl]-4-morpholinobenzamide monohydrobromide between 3 to 7 hours.
- 15 29. Use of disintegrants in preparing an oral immediate release dosage form of an active compound that forms an agglomerate upon contact with water, at acidic, neutral or basic pH.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2003/001910

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61K 9/20, A61K 47/38, A61K 31/5377, A61P 25/00  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61K, A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CHEM.ABS.DATA, EMBASE DATA, BIOSIS DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6228857 B1 (STEFAN BERG ET AL), 8 May 2001 (08.05.2001), column 4, line 44 - column 5, line 4, examples 16-18, claims 6-8 --	1-29
X	US 6159971 A (STEFAN BERG ET AL), 12 December 2000 (12.12.2000), column 4, line 39 - column 5, line 4 --	1-29
X	EP 1327440 A1 (SUMITOMO PHARMACEUTICALS COMPANY, LIMITED), 16 July 2003 (16.07.2003), claim 1, examples tables 20, 24, 28 --	1-29

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 April 2004

Date of mailing of the international search report

20-04-2004

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2003/001910

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol., 1998, no.10, 31 August 1998 (1998-08-31) & JP 10114655 A (KYOWA HAKKO KOGYO CO LTD), 6 May 1998 (1998-05-06) abstract  --	1-29
A	WO 0236126 A1 (LUPIN LIMITED), 10 May 2002 (10.05.2002)  --	1-29
A	EP 0533268 A1 (GLAXO GROUP LIMITED), 24 March 1993 (24.03.1993)  -- -----	1-29

INTERNATIONAL SEARCH REPORT  
Information on patent family members

31/03/2004

International application No.

PCT/SE 2003/001910

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International application No.

PCT/SE 2003/001910

US 6159971 A 12/12/2000

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# INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/SE2003/001910**

## Box No. II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: **20-25**  
because they relate to subject matter not required to be searched by this Authority, namely:  
**see extra sheet**
2. ☒ Claims Nos.: **1 and 2**  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
**see extra sheet**
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

**see extra sheet**

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
**1-29**

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.



## Box II.1

Claims 20-25 and 27 relate to methods of treatment of the human or animal body by surgery or by therapy or diagnostic methods practiced on the human or animal body (PCT Rule 39.1(iv)). Nevertheless, a search has been executed for these claims. The search has been based on the alleged effects of the compounds or compositions.

## Box II.2

The expressions "disintegrant", "soluble filler" and "binder" in claims 1 and 2 do not allow a complete search of the full scope of the expressions in question. The present wording of the claim cannot be considered to fulfill the requirements of clarity and conciseness (article 6 PCT). Therefore the search has been based on the substances mentioned in claims 5, 7 and 9.

## Box III

The International Search Authority considers that there are three inventions covered by the claims indicated as follows:

I: Claims: 1-28 (partially) and 29 directed to an oral immediate release dosage form comprising N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphtyl]-4-morpholinobenzamide or its salts (or other active compounds that forms an agglomerate upon contact with water-claim 29) and at least one disintegrant and optionally at least one soluble filler and/or one binder.

II: Claims 1-4, 7-14, 16-18 and 20-28 (all partially) directed to an oral immediate release dosage form comprising N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphtyl]-4-morpholinobenzamide or its salts and at least one soluble filler and optionally a binder.

III: Claims 2-4, 9-14, 17-18 and 20-28 (all partially) directed to an oral immediate release dosage form comprising N-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphtyl]-4-morpholinobenzamide or its salts and at least one binder.

The ISA has carried out a partial search which relates to invention I mentioned above.

The applicant is invited to pay two additional fees for each of the inventions II-III as listed above.

.../...

The present application has been considered to contain three inventions which are not linked such that they form a single general inventive concept, as required by Rules 13.1, 13.2 and 13.3 PCT for the following reasons:

The three inventions all relate to the problem of providing an oral immediate release dosage form comprising *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphtyl]-4-morpholinobenzamide or its salts. However the application provides three different kinds of dosage forms comprising different excipients namely:

The subject matter defined as invention I above relates to an oral immediate release dosage form comprising the active compound and at least one disintegrant.

The subject matter defined as invention II above relates to an oral immediate release dosage form comprising the active compound and at least one soluble filler.

The subject matter defined as invention III above relates to an oral immediate release dosage form comprising the active compound and at least one binder.

The features that these different formulations have in common are that they are oral immediate release dosage forms comprising *N*-[5-methyl-8-(4-methylpiperazin-1-yl)-1,2,3,4-tetrahydro-2-naphtyl]-4-morpholinobenzamide or its salts. Such dosage forms are however known from US 6,228,857 B1. Hence the claims are not linked by any common special technical feature apart from the prior art. Consequently, the requirements of Rules 13.1 and 13.2 PCT are not met.

Only invention I (claims 1-28 (partially) and 29) has been search.

INTERNATIONAL SEARCH REPORT  
Information on patent family members

31/03/2004

International application No.

PCT/SE 2003/001910

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